Remarks

The Specification was amended mainly to correct editorial errors and to correct a few non-unified terms. No new subject matter is added and no subject matter is altered.

All old claims are cancelled and new claims 19-44 are added. Claim amendments are further discussed in the sections below.

1. On 35 U.S.C. 112 rejection

Claim 1-18 are rejected as being indefinite. These claims are now cancelled. New claims are provided to define the subject matters clearly and distinct from the prior arts.

2. On obviousness rejection over Clark (5,629,802)

Claim 1-3, 7-8, 10-13 and 16-18 are rejected as being obvious over Clark. These claims are now cancelled. New claims are provided to define the subject matters clearly and distinct from the prior arts. The differences between current application and the prior art can therefore best be discussed in the context of the new claims.

Referring to new claim 19, the major features and their differences as compared to Clark's are described as follows,

(1) Claim 19 now defines a method of creating a 2D image frame of multiple levels of an optical property (e.g. color, or grayscale, or polarization, or phase as alternative optical properties that can apply this invention). Clark's has neither disclosure nor attempt of displaying a single 2D image with gray or color levels. Examiner cites Clark col. 3 lines 13-15 to state that Clark illuminates each sub-panel with a light of different property. However, the purpose of Clark's "intensity control" is different. In Clark's, one sub-area is illuminated by only one point source (col. 1 lines 64-65, col. 3 lines 18-21, and Fig. 1). Therefore, the brightness of one point source affects the brightness of one whole sub-area uniformly. As a result, there is no way grayscale image can be produced or enhanced by Clark's illumination setup. We should take note that Clark's point source is for the purpose of optical comparator (correlator). The intensity control is only for adjusting the quality of each correlation signal spot received on camera, which is not a 2D image at all, not for generating images of grayscale.

(2) Claim 19 defines a method that illuminates each sub-panel with light of a different "basic component" (e.g. primary color, if the optical property is color) and different basic components can combine to make multiple levels of the optical property (e.g. different primary colors can combine to make different colors). Clark's illumination has no such basic components to combine to make multiple levels of color or grayscale.

(3) Claim 19 defines a method that recombines sub-panel images to form a single 2D image frame of multiple level of an optical property by an image combining means. In Clark's, each sub-area displays a 2D image pair (col. 3 lines 65-67). An SLM having several sub-areas can therefore hold several image pairs at one time. Clark's purpose to put many image pairs in one frame is to increase throughput by processing multiple image pairs at the same time (as clearly described in col. 1 lines 24-36, and in the title "spatially multiplexed"). As a result, in Clark's, combination of different sub-areas has no meaning in terms of image content. Clark makes no attempt for such combination. **Examiner's statement (page 3, section 4, paragraph 4) that in Clark "... the images of each sub-panel are merged in order to project a uniform image" is wrong and has no base in terms of Clark's at all.** We should further take note that Clark's lens f2 functions as a Fourier transformer, not a projection lens. The image formed after the lens (item 123) is the Fourier transform of the SLM image and has a visual content (as appearing to human eye) totally different from the original SLM image. In addition, for the lens to function as a Fourier transformer, the SLM must be at the front focal plane of the lens. (Hecht, E. Optics, pp. 477) As a result, the lens can not produce a real image carrying the original visual content. For single SLM Joint Transform Correlator, also refer to Wilkinson, T.D. et al. "Optical Comparator based on an FLC over Silicon SLM", printout from www.-g.eng.cam.ac.uk/photonics/corry/jtc.html. and Javidi & Horner US Pat. No. 5,119,443. Pertinent pages in Hecht's and in Wilkinson's are included in the attached Information Disclosure Statement (No. 2) for Examiner's reference.

3. Obviousness rejection over Clark in view of Maki et al. (6,609,796)

Claims 3-6, 9 and 14-15 are rejected as being obvious over Clark in view of Maki. These claims are now cancelled. New claims are provided to define the subject matters clearly and distinct from the prior arts. The differences between the current application and the prior arts can therefore best be discussed in the context of the new claims.

3.1 On claim 19:

In section 2 of this Remark, it has been established that Clark's alone has no way of anticipating the features in claim 19. Maki's describes techniques for handling the reliability of opto-mechanical assemblies in projectors. It describes nothing about sub-panels or forming grayscale 2D images on one frame of an SLM. Therefore, there is no obvious way to combine Maki's with Clark's to reach claim 19.

3.2 On claim 37:

Claim 37 defines a method of creating multiple sub-frames of 2D images from one single frame of a SLM by illuminating different sub-panels at different time in order for increased frame rate.

First, it should be pointed out that **Examiner's statement (page 4, section 6, paragraph 3) that "... the system of Clark is a multiplexed spatial optical signal processing, thus, the image of T1-T5 are distributed in the sub-panel areas(t1-t5) in the time domain" is wrong and is a misunderstanding of Clark's.** As already pointed out in section 1 of this Remarks, Clark's system applies "spatial multiplexing" by processing multiple image pairs simultaneously to achieve high throughput. That is, t1-t5 are Fourier Transformed at the same time to obtain T1-T5. Therefore, Clark's multiplexing is in space domain, not in time domain.

Second, it was also pointed out previously that Clark's lens f2 functions as a Fourier transformer, not a projection lens and that the image formed after the lens 121 (T1-T5) is the Fourier transform of the SLM image and has a visual content totally different from the original SLM image (t1-t5). Therefore, it is fundamentally impossible to compare Clark's T1-T5 to the "sub-frames" of claim 38.

Based on the above understandings, we see Maki's can not be combined with Clark's in any way to reach claim 38.

3.3 On claim 40:

Claim 40 defines a method of creating 2D image frames using multiple SLMs by illuminating different SLMs at different time in order for increased frame rate.

Although Maki's description has multiple SLMs, no additional descriptions can be found to be combined with Clark's to reach claim 41. The two arguments in section 3.2 also apply to claim 41 to overcome Clark's with Maki's. **Examiner's misunderstanding of Clark's "multiplexing" is emphasized again here.**

3.4 On claim 44:

Claim 44 defines a method creating a 2D image frame capable of representing images of multiple levels of color or grayscale with one frame of a SLM for the purpose of optical correlator. A composite pixel structure is defined to assign sub-pixels with different primary colors or brightness strengths of a preset ratio. Clark's has no such composite pixels and has no such capability of representing images of multiple colors or grayscales.

4. Conclusions:

All new claims 19-44 are submitted to be patentable over the art of record.

If the enclosed papers are considered incomplete, the Examiner is respectfully requested to contact Applicant at (781) 646-3587, Arlington, Mass, to advance the prosecution of this application in any respect. If this response is not considered timely filed in the absence of a request for an extension of time, Applicant hereby requests the necessary extension.

Respectfully,

Che-Chih Tsao, Ph.D.
ACT Research Corporation
16 Walnut St., #43
Arlington MA 02476
(Phone/Fax) 781-646-3587

Date/Time: Sep. 7, 2004